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Solution by J. SCHEFFER, A. M., Professor of Mathematics, Kee Mar College, Hagerstown, Md.

We have $\log(1+\frac{1}{x})=\frac{1}{x}-\frac{1}{2x^2}+\frac{1}{3x^3}-\frac{1}{4x^4}+\ldots$, and

$$\log(1-\frac{1}{x})=-\frac{1}{x}-\frac{1}{2x^2}-\frac{1}{3x^3}-\frac{1}{4x^4}-\ldots$$

$$\therefore \tfrac{1}{2}\log\left(\frac{1+(1/x)}{1-(1/x)}\right)=\tfrac{1}{2}\log\left(\frac{x+1}{x-1}\right)=\frac{1}{x}+\frac{1}{3x^3}+\frac{1}{5x^5}+\frac{1}{7x^7}+\frac{1}{9x^9}+\ldots$$

Likewise, $\tfrac{1}{2}\log\left(\frac{x^3+1}{x^3-1}\right)=\frac{1}{x^3}+\frac{1}{3x^9}+\frac{1}{5x^{15}}+\ldots$

$$\therefore \tfrac{1}{2}\log\left(\frac{x+1}{x-1}\right)-\tfrac{1}{2}\log\left(\frac{x^3+1}{x^3-1}\right)=\tfrac{1}{2}\log\left(\frac{x^2+x+1}{x^2-x+1}\right)=\frac{1}{x}-\frac{2}{3x^3}+\frac{1}{5x^5}+\frac{1}{7x^7}$$

$-\frac{1}{9x^9}+\ldots$ or $s_n=\log\left(\frac{n^2+n+1}{n^2-n+1}\right)$.

$\therefore s_3=\log\frac{13}{7}$ and $s_4=\log\frac{21}{13}$. $\therefore s_3+s_4=\log(\frac{13}{7}\times\frac{21}{13})=\log 3$. Likewise, $s_2+s_3+s_4=\log\frac{13}{3}+\log\frac{13}{7}+\log\frac{21}{13}=\log(\frac{13}{3}.\frac{13}{7}.\frac{21}{13})=\log 13$, and

$$s_2+2s_3+s_4=\log\tfrac{7}{3}+2\log\tfrac{13}{7}+\log\tfrac{21}{13}=\log(\tfrac{7}{3}.\tfrac{169}{49}.\tfrac{21}{13})=\log 13.$$

DIOPHANTINE ANALYSIS.

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137 (Incorrectly numbered 136). Proposed by A. H. HOLMES, Brunswick, Maine.

Given $7x^2-111=y^2$. Required a value for y greater than unity which shall be a prime integer.

II. Solution by the PROPOSER.

$7x^2-111=y^2$. Put $x=u+a$. Then $7u^2+14au+7a^2-111=y^2=[pu+\surd(7a^2-111)]^2$; $7u^2+14au=p^2u^2+2pu\surd(7a^2-111)$.

$$\therefore u=\frac{14a-2p\surd(7a^2-111)}{P^2-7}.$$

Put $p=3$. $\therefore u=7a-3\surd(7a^2-111)$.

Put $a=5$. Then $u=35-24=11$, and $x=16$.

$7\times16^2-111=41^2$. $\therefore y=41$.

This solution shows that Professor Scheffer's solution in the June-July number, p. 148, did not yield the *least* prime, satisfying the equation, as is there stated. Ed. F.